PATENT SPECIFICATION

673,998

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COMPLETE SPECIFICATION

Improvements in and relating to Fuelling and Servicing Systems for Airplanes

We, ALBERT EDWARD WATTS, JR., and JACK ROYAL PARKER, both citizens of the United States of America, respectively of 410, East Shore Road, Great Neck, Long Island, New York, United States of America, and 1837, Coleman Street, Brooklyn, New York, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a fuelling and servicing system for airports or lesser landing fields, and more particularly, of the type having submerged fuel storage tanks and distributing piping leading to a number of fuelling and servicing units disposed relative to the landing strips or loading areas, so that the units are in proper position to fuel and service the plane. When not in use, such fuelling and servicing units are contained within a pit casing submerged in the ground, so that with the cover plate closing the pit, no obstruction appears on the ground.

In a fuelling and servicing system of the aforesaid type, the invention comprises, in combination, a submerged pit casing, a cell unit containing fuelling and servicing equipment and supported for vertical movement from a lowered position entirely within the pit casing to an elevated position above the pit casing, a plate for closing the pit casing when said unit is in its said lowered position, and means located in the pit casing including a motor and a control therefor for raising and lowering the cell unit, said plate having a handhole for access to said raising-and-lowering control.

The invention is illustrated by way of example by the accompanying drawings, of which

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Fig. 1 is a sectional elevation through an improved dispensing unit (on the line 1—1 of Fig. 2);

Fig. 2 is a cross-sectional view of the unit, taken on the line 2—2 of Fig. 1;

Fig. 3 is another sectional elevation, but taken on the line 3—3 of Fig. 2;

Fig. 4 is a top view of the unit, looking in the direction of lines 4—4 of Fig. 3;

Fig. 5 is a fragmentary elevational section, on the line 5—5 of Fig. 4;

Fig. 6 is a detail of the weatherproof caps for the handrails, being in section;

Fig. 7 is a top view of the caps (Fig. 6);

Fig. 8 is an elevational view, with the unit in elevated position;

Fig. 9 is a detail view, in section, of the construction of the platform extension;

Fig. 10 is a detail view, partially in section, of the means employed for moving the platform extension;

Fig. 11 is a detail showing the means which prevents the lowering of the unit without first retracting the platform extension;

Fig. 12 is an elevational section, taken on line 12—12 of Fig. 13, showing the mechanism for rotating the unit;

Fig. 13 is a plan view of the parts of Fig. 12, looking in the direction of line 13—13 in Fig. 12, but on a somewhat reduced scale;

Fig. 14 is a perspective view of the tank and pumping system and the distribution piping to various dispensing units, and showing one unit in elevated position and fuelling the wing tank of an airplane;

Fig. 15 is a side view of an airplane, with the dispensing unit in position to fuel its wing tank;

Fig. 16 is a plan view, on reduced scale, of two airplanes and a plurality of

dispensing units in position relative to the wings thereof, and

Fig. 17 is a front view of a dispensing unit, showing its platform extension, lights and register.

The improved system of our invention comprises a plurality of submerged fuel storage tanks 32 (see Fig. 14) each having a submerged pump 29 to pump the fuel through a plurality of distributing pipes 28, each connected to one or more dispensing and servicing units. Only one such unit is shown in Fig. 14 where it is represented by a pit casing 3 which is set into the ground, and the dispensing and servicing unit 1 which is shown in elevated position in Fig. 14, to fuel the wing tank of an airplane 33.

Said tank pump 29 is disposed in accessible position in a submerged pump pit 66 at each storage tank 32, being shown in Fig. 14 in overlying relation thereof. Each storage pump unit is provided with a check valve 71 in its distributing pipe 28. From the main distributing line 28 of a storage unit 32—66, e.g. the extreme left one shown in Fig. 14, T-branches are provided for the several dispensing units on that particular line. One such T-branch is shown leading to a submerged valve pit 31 adjacent to the dispensing unit.

The inlet connections to the storage tanks 32 is indicated in Fig. 14, at 69. The vent pipe of these tanks is shown at 68. Additionally, each pump pit 66 has a depth gauge 67 (shown only in connection with the extreme right tank 32).

Referring now to Fig. 1, the submerged pit casing 3 of each dispensing and servicing unit has an annular rim 16 flush with the ground (14), having an annular rabbet or shoulder to accept a circular plate 15, as clearly shown in Fig. 1. The elevatable dispensing and servicing unit, Fig. 1, is generally designated 1 which reference number points to an enclosed cylindrical cell. Cell unit 1 is supported by a plurality of telescopic pistons 2 working in their respective cylinders, the elevation or lowering of unit 1 being controlled by the oil pressure to the piston cylinders (as will be more fully described subsequently).

The submerged valve pit 31 described above in connection with the general showing of Fig. 14, appears in Figs. 1 and 2 adjacent the pit casing 3. The aforesaid distributing pipe 28 (from the storage pumps, Fig. 14) is shown in Figs. 1—2 connected through a solenoid operated valve 24 to a short length of pipe 28^x to a flexible hose 26 within the pit casing 1 in underlying relation to cell unit 1, the flexible hose leading into the bottom of the cell unit, as clearly shown in Fig. 1. Within the cell unit flexible hose 26 connects through a check valve 25, strainer 5 and meter 4 to a hose reel 9. The nozzle of the hose of reel 9 is designated 12; when it is lifted off its hook or seat in which it is normally disposed, a wired connection (not shown) to solenoid valve 24 causes the latter to open and permit the flow of fuel until the nozzle is replaced on its hook, this flow being registered on dial 8 connected to meter 4. Hose reel 9 is implemented with a pulley 10 which is belt or otherwise driven from an electric motor 11, for winding up the hose after use.

Valve pit 31 also has a motor control 23, Fig. 1, for a sump pump 27 for draining the bottom of pit casing 3, the discharge therefrom being a small pipe 72 leading back to valve pit 31.

The aforesaid circular plate 15 which in the normal, lowered position of the elevatable unit, Fig. 1, is flush with casing rim 16 and ground 14, is provided with a plurality of holes 13^x wherethrough respective ones of the vertical standards 13 of a guard rail are slidable, as clearly shown in Fig. 1. Vertical standards 13 of the guard rail are secured to the top of the elevatable unit 1, and form a partial circular enclosure, see Fig. 4, by a plurality of arcuate hand rail sections 43^x which connect to a cap 43 secured at the top of vertical standards 13, see detail, Figs. 6—7. As shown in the latter figures, circular plate 15 is provided with recesses 44 for caps 43, so that when the unit is lowered into the ground, caps 43 completely cover holes 13^x in plate 15, thus making the installation completely rainproof. Additionally, the top surface of plate 15 has an arcuate groove 15^x, Fig. 6, for snugly receiving the rail sections 43^x. Hence in the normal, lowered position of the unit, cap 43 will be received in recess 44 and rail sections 43^x in arcuate grooves 15^x, so that a flush surface will be presented with no projections which might trip persons on the field.

In operation, the attendant stands on the circular plate 15 (within the area defined by the rail sections 43^x, which in the normal, lowered position of the unit, are close to the top surface of plate 15) and, by certain manipulations—soon described—causes the cell unit 1 to rise. As the cell unit rises, the vertical standards 13 project upwardly, through their said openings in plate 15, thus forming a guard enclosure about the attendant. When the cell, in continuing to rise, or rather its top 41 reaches the underside of

circular plate 15, see Fig. 5, the latter—together with the attendant thereon—is likewise raised by the ascending unit. Shock absorbers 22 are provided on top 41 of the unit to ease the abutting of the cell top 41 and the circular plate 15.

In circular plate 15 is a handhole 42 wherethrough the attendant can reach the controls for elevating the unit, the fuel nozzle 12, etc. Just below opening 42 is a control 38 which is connected by flexible wire 40, Fig. 3, to motor 20 which drives oil pump 21 for operating the elevating-and-lowering positions 2; the oil reservoir is designated 19 and the oil pressure piping 39. Control 38 may be fitted with a deadman's switch, so that when the operator removes his hand from control 38 the cell will remain at whatever elevation it had been brought when the operator's hand is removed.

The other controls are assembled for ready access in a control box 34 on the roof 41 of the unit, easily reached when handhole 42 is opened. Among these is a control 36 for motor 11 for rewinding the fuel hose on reel 9, and a control 37 for resetting the register. These controls enable parts within the cell unit 1 to be operated from outside of the cell. However, the sides of the cell are removable so that, when the inner parts are to be repaired, the unit is elevated to the desired height from the ground, and the particular side or sides removed to gain ready access to the interior of the unit.

The cell unit 1 is continued in its ascent by the attendant standing on its circular plate 15, until it is raised to the proper elevation relative to the wing of the airplane, as in Fig. 15. To facilitate the attendant's movement between circular plate 15 of the elevated unit and the top of the wing, a platform extension 17 is spanned from the unit to the wing. Normally, the platform extension is contained within cell 1 just below its roof or top 41, Fig. 1. The construction of platform extension 17 is detailed in Figs. 9 and 10, where it will be seen that the platform 17 is in the form of an exaggerated I in section; it is slidably mounted on a pair of frame members or tracks 50 which are disposed in the two channels of the I-shape, the platform having a plurality of horizontally-disposed anti-friction rollers 49 between it and the top and bottom surfaces of horizontal tracks 50 and a plurality of vertically-disposed anti-friction rollers 49^x between its web and the side edges of tracks 50. It will be observed, best from Fig. 4, that the guard rail 43^x does not form a complete circle but that a wide portion has no rail; this is omitted so that the attendant may move from the circular plate 15 to the wing or other part of the airplane; also, it will be observed from this figure that the platform extension 17 is so disposed that it may be moved outwardly at this point (where there is a gap in the guard rail).

For the purpose of extending and retracting platform 17, its underside is provided with rack teeth 51 with which mesh a pinion 52 secured on a spindle 54 from a speed reducer 53 driven by a motor 18, Fig. 10. The control or switch for platform motor 18 is designated 55 in Fig. 2 and is on the aforesaid control box 34. The motor 18 and reducer 53, Fig. 10, are fitted with reversing mechanism so that the platform extension 17 can be extended from, or retracted into, the cell unit 1 at will. The distal end of the platform extension is provided with a rubber bumper 56 to protect the surface of the airplane wing.

To assure that platform extension 17 has been retracted into cell unit 1 before the latter descends into pit casing 3, the safety device shown in Fig. 11 is provided. In this figure the circuit to the elevator motor 20 (shown in Fig. 3) is designated 57 and has in one of its lines contacts 57^x, 57^x, which are connectable by a jumper 58^5. The latter is disposed at one end of a short spindle 58 slidably mounted in a wall of a housing 60; a compression helical spring 58^s between the housing and an enlarged head 58^1 on the distal end of spindle 58 normally tends to move the spindle outwardly (to the right in Fig. 11) to withdraw jumper 58^x and thus open the circuit to the elevator motor. It will be noted from Fig. 11 that said enlarged head 58^1 of the spindle is abuttable by the rack 51 (or other part) of platform extension 17. In the normal, retracted position of platform extension 17 (to the left in Fig. 11) spindle 58 is maintained in circuit-closing position, against the opening-urgency of spring 58^s. When the platform is projected (to the right), its end leaves the spindle head 58^1, thus permitting the spring to open the circuit to the elevator motor.

It may be desirable to rotate the unit to facilitate the positioning or spanning of the platform extension between the unit and the wing of the airplane. For this purpose a ring 61, Figs. 12—13, having internal teeth is secured to the underside of cell unit 1, with which meshes a pinion 65 secured at one end of a spindle 64 driven through a speed reducer, from motor 63 secured to a base plate carried by the pistons 2. Anti-friction bearings 62 are provided for mounting cell unit 1

for rotation on the said base plate. The control for motor 63 may be located in the aforesaid control box, to enable the unit to be turned in either direction.

Cell unit 1, Fig. 1, may be provided with CO_2 tanks 6 and hose reel 7. The outside of the cell unit 1, Fig. 17, is provided with a flood light 30, and also with a gasoline consumption dial 8. The unit may be provided with other accessories, such as a defuelling system, battery-charging system, air-conditioning blowers and fans for readying planes before take-off.

A plurality of bars 45, Fig. 8, are spaced about cell unit 1 and secured at their upper ends to the underside thereof; the lower ends of suspension bars 45 are secured to a circular plate 46, to the outer circumference of which is attached a strip 47 of neoprene or other suitable material. Suspension bars 45 are sufficiently long so that in the extreme elevated position of the unit, annular strip 47 will still be in engagement with the interior wall of pit casing 3, to serve, together with plate 46, as a water seal to prevent rain or other liquid from entering the pit casing when the unit is in elevated position, as it is in Fig. 8. Mesh wire or the like may be encircled about the bars 45 to prevent persons from passing under the unit when in elevated position.

We are aware of a fuelling and servicing system for airplanes, comprising, in combination, a submerged pit casing, a cell unit containing fuelling and servicing equipment and supported for vertical movement from a lowered position entirely within the pit casing to an elevated position above the pit casing, a plate for closing the pit casing when said unit is in its said lowered position, and means located in the pit casing including a motor and a control therefor for raising and lowering the cell unit. In this arrangement, the attendant enters the elevator pit through a trap-door in the roof or cover of the pit casing and descends down steps to enter the cell unit and, in this position, operates control buttons for raising and lowering the cell unit.

We would have it understood that we do not claim anything herein which is claimed in the Specification of our Application for Letters Patent No. 15944 of 1951 (Serial No. 674,118).

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In a fuelling and servicing system of the aforesaid type, in combination, a submerged pit casing, a cell unit containing fuelling and servicing equipment and supported for vertical movement from a lowered position entirely within the pit casing to an elevated position above the pit casing, a plate for closing the pit casing when said unit is in its said lowered position, and means located in the pit casing including a motor and a control therefor for raising and lowering the cell unit, said plate having a handhole for access to said raising-and-lowering control.

2. The combination according to claim 1, wherein the cell unit is supported on telescopic pistons and contains an oil pressure system for actuating said pistons.

3. The combination according to claim 1 or 2, the said handhole enabling an attendant to cause said cell unit to rise together with said plate with himself standing thereon.

4. The combination according to any of the preceding claims, wherein a plurality of vertical standards extend upwardly from the roof of the cell unit and said plate is provided with openings for slidably engaging said vertical standards, said vertical standards guiding the initial movement of the cell in relation to the plate until the top of the cell unit abuts the plate, and thereafter holding the plate on the cell unit so that the two are raised together.

5. The combination according to claim 4, wherein the vertical standards are provided at their upper ends with arcuate sections to form a guard rail substantially encircling the plate when the cell unit is elevated.

6. The combination according to claim 5, wherein the upper surface of the plate is provided with an annular groove for receiving the arcuate sections, so that no part of the guard rail projects above the plate in the lowered position of the cell unit.

7. The combination according to claim 4, wherein the vertical standards are provided at their upper ends with enlarged caps, and the upper surface of the plate is provided with a recess for said cap, so that a waterproof seal is provided for said openings in the plate.

8. The combination according to any of the preceding claims, comprising a platform extension mounted on the cell unit for lateral projecting movement in relation to the unit and for retractive movement within the unit.

9. The combination according to claim 8, comprising mechanism for raising and lowering the cell unit, and means for making said mechanism inoperative when

the platform extension is in the laterally projected position.

10. The combination according to claim 9, wherein the raising-and-lowering mechanism includes an electrical circuit provided with an open contact, and the means for making said mechanism inoperative includes a jumper for closing said contact normally spring urged to circuit-opening position, and an element, abuttable by the platform extension when in the retracted position, for moving the jumper to the circuit-closing position.

11. The combination according to any of claims 8, 9 and 10, provided with means including a motor, a speed reducer and a rack and pinion connection, for moving the platform extension to its laterally projected position and to its retracted position.

12. The combination according to any of claims 8, 9 and 10, comprising means including a motor, a speed reducer and an internal gear and pinion for rotating the cell unit about a vertical axis to position angularly the laterally projecting platform extension.

13. The combination according to any of the preceding claims, comprising means for sealing the pit casing when the cell unit is in an elevated position in relation to the pit casing.

14. The combination according to claim 13, wherein the sealing means comprises a plurality of bars suspended from the bottom of the cell unit and a plate secured to the lower ends of said suspended bars and provided at its periphery with packing material in sliding, sealing relation to the inside wall of the pit casing.

15. The combination according to claim 14, comprising wire mesh embracing the suspended bars to block passage under the cell unit when in its said elevated position.

16. The combination according to claim 11 or 12, wherein a control for said motor is accessible through the handhole.

Dated this 14th day of October, 1949.

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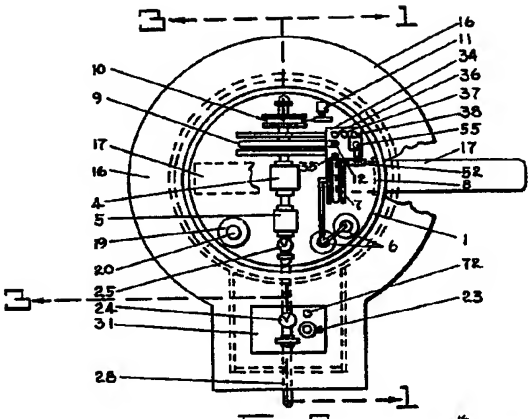
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Fig. 2

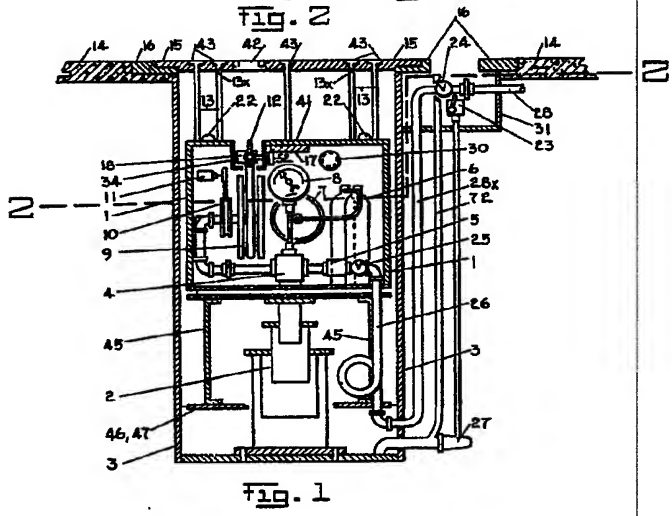
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Fig. 1

673,998 COMPLETE SPECIFICATION

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SHEETS 1 & 2

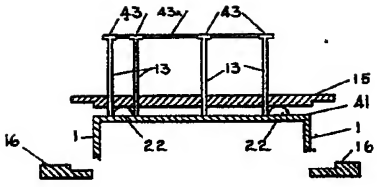

Fig. 5

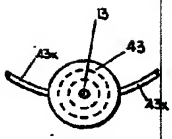

Fig. 7

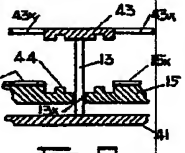

Fig. 6

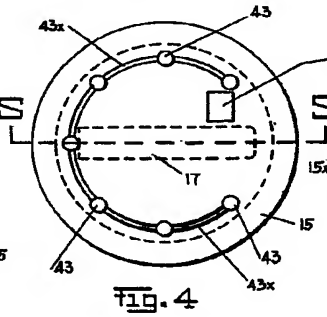

Fig. 4

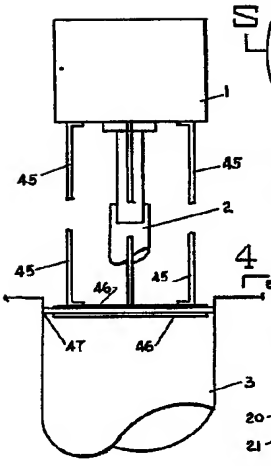

Fig. 8

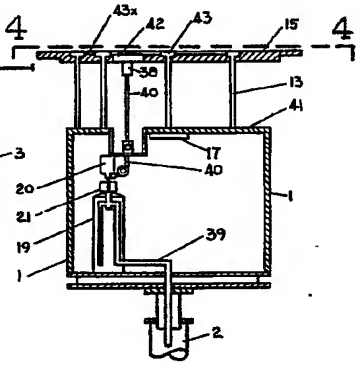

Fig. 3

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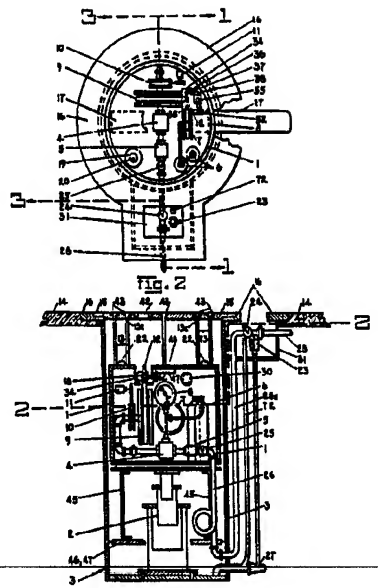

Fig. 1

Fig. 2

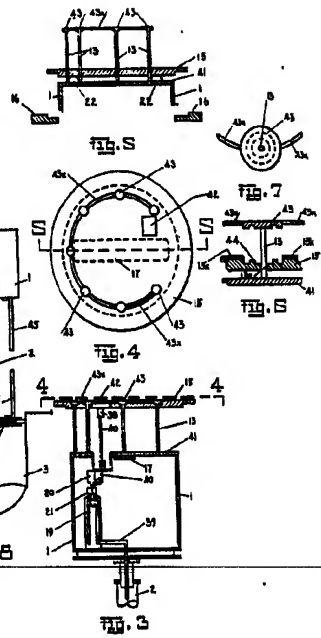

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

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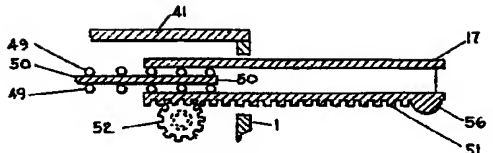


Fig. 9

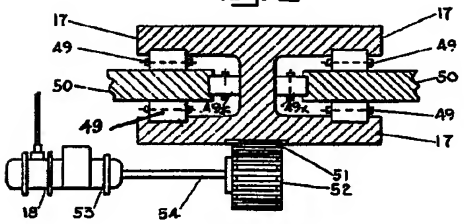


Fig.10

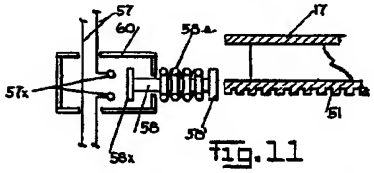


Fig.11

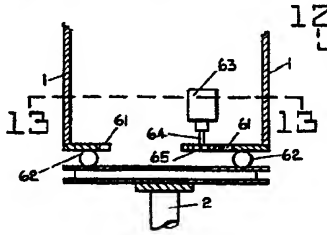


Fig.12

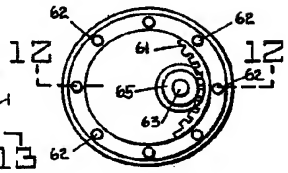


Fig.13

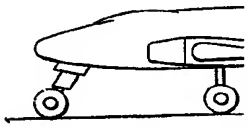
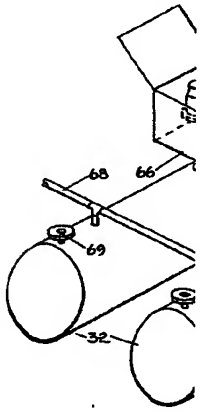


Fig.1



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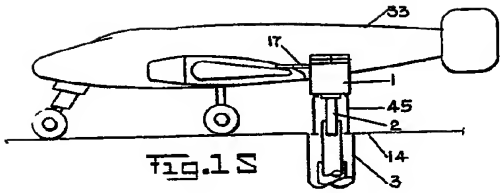


Fig.15

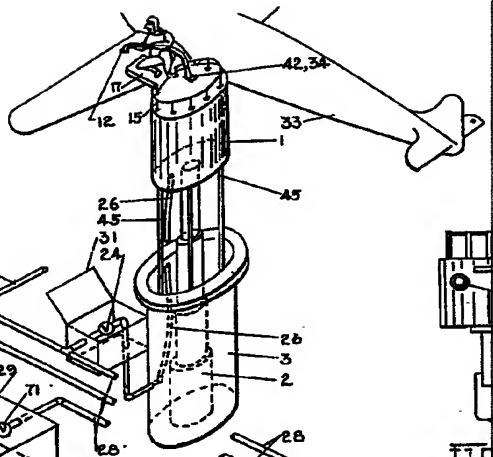


Fig.14

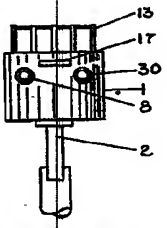
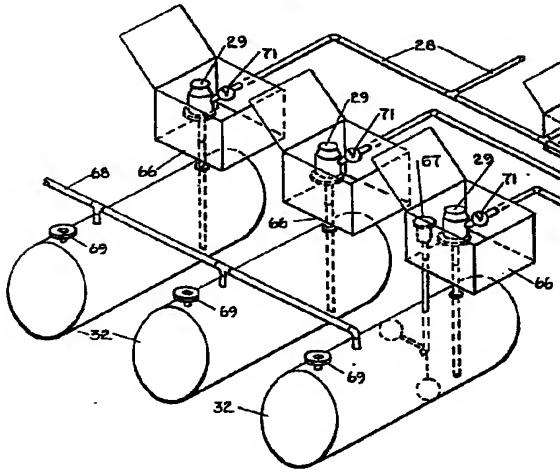


Fig.17



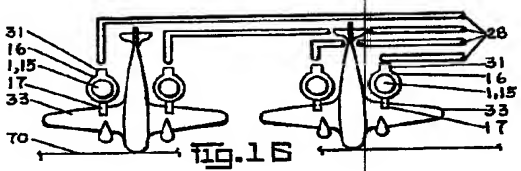


Fig.16

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SHEETS 3 & 4

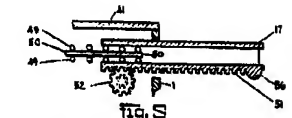

Fig.9

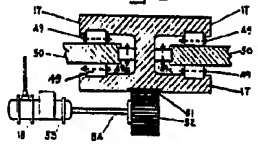

Fig.10

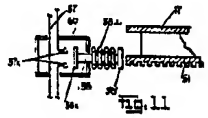

Fig.11

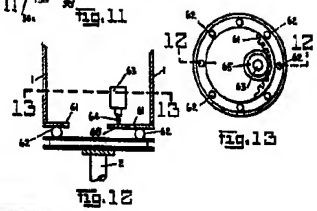

Fig.12

Fig.13

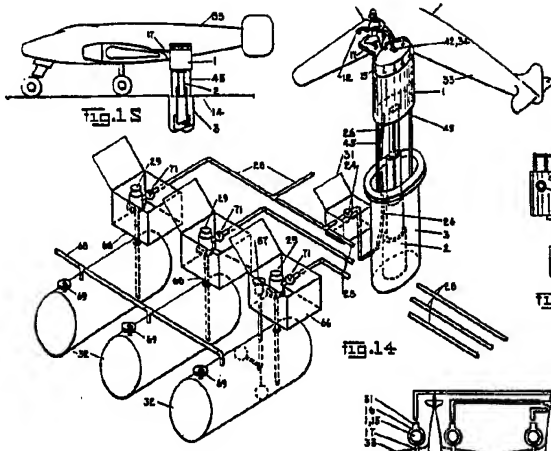

Fig.14

Fig.15

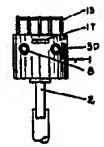

Fig.17

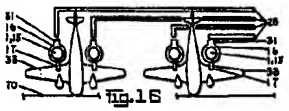

Fig.16